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Assessment of the Artisanal Shark Fishery and Local Shark Fin Trade on Unguja Island, Zanzibar

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* * *

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ABSTRACT

This study investigates the current state of the directed artisanal shark fishery off Unguja Island, Zanzibar, with a focus on the East Asian shark fin trade and its impact on the utilization of this valuable marine resource. The study concentrates on the two fish markets in Stone Town: Malindi and Darajani. Large fish are brought to these markets both from nearby waters and from other coastal towns on the island. Data was gathered through observation of the type and number of sharks landed, fishing practices employed, and sale of shark products, particularly fins. Local fin traders and exporters were interviewed to determine the characteristics of the local market, the relative value of different fin types, and changes in volume and demand over time. Local fishermen were interviewed to investigate directed exploitation of sharks, changes in shark populations over time, and the possible influence of the fin trade on fishing activities. Results provide a preliminary insight into the current status of the directed shark fishery, the logistics of the fin trade, and conservation implications for coastal shark populations.

INTRODUCTION

Zanzibar Artisanal Fisheries

The Zanzibar archipelago is located in the East African Indian Ocean, 35 miles off the coast of Tanzania and 6 degrees below the equator (see map, p.8). Zanzibar is made up of two islands, Unguja and Pemba, and is joined politically to the mainland to form the United Republic of Tanzania.[1] The climate in this region is tropical, with temperatures remaining above 20^{o}C year-around. Seasonality is defined by two monsoon winds: the NE monsoon, known locally as "Kaskazi," occurs from November to March and is marked by short rains; the SE monsoon, or "Kusi," occurs from June to September, and is characterized by strong winds. The rainy season occurs between Kaskazi and Kusi.[2]

The fishing industry is one of Zanzibar's most essential sectors, involving not only fishermen, but also boat builders, gear manufacturers, and traders.[3] According to FAO statistics from 1995, it is estimated that approximately 14% of people in Zanzibar rely directly on fishing to support their lifestyle. These roughly 23,000 fishermen, 2,500 fish traders, and their families are among the poorest populations in Zanzibar.[4] The Zanzibar fishing industry is 95% artisanal, meaning that traditional fishing methods are still employed. Vessels widely used include canoes, dhows, and small boats powered by either sails or outboard motors. A wide variety of pelagic and demersal fish species are targeted using traps, nets, and lines. [5]

The fishery is seasonal, with the highest catches occurring during the NE monsoon when waters are calmer. The majority of fishing activity is concentrated in the shallow waters of the continental shelf, which extends 60km into the Zanzibar Channel with the mainland and 4km offshore in the rest of the island for a total area of roughly 30,000km^2. Rising populations at the coast and increasing numbers of fishermen over the years have intensified pressure on stocks in this area. Overall catches have been on the increase in recent years, with total annual landings nearing 22,000 tons. Fisheries stocks are currently thought to be approaching maximum exploitation.[6]

Zanzibar Shark Fishery

Sharks have been targeted by artisanal fishermen in both Tanzania and Zanzibar for hundreds of years,[7] shark meat being a staple food in the region.[8] Gears used to target sharks include drift gillnets, demersal gillnets, and long lines, with an estimated

[1] Zanzibar.net, http://zanzibar.net/zanzibar/what_is_zanzibar, accessed 5/14/04
[2] Richmond, pp.12-13.
[3] Jiddawi, N.S., Shehe, M. A. (1997) 104.
[4] Suleiman, I.A. (1997) 7.
[5] Jiddawi, State of the Coast Report 2003, pp.11-13.
[6] Jiddawi, State of the Coast Report 2003, pp.11-13.
[7] Barnett, 41.
[8] Traffic, 6.

catch of 1103mt/yr.[9] Shark meat is generally considered low in quality and value compared to certain bony fish species, such as snapper, grouper, tuna, and kingfish.[10] However, its value is roughly average with regard to all fish species, at around 500Tsh/kg.[11] One benefit of shark meat is its long shelf life when dried and salted, although meat is much less in valuable dry than fresh.[12] Overall, sharks can be considered a significant marine resource for the people of Zanzibar.

Shark Biology and Exploitation

Sharks are of particular interest from a fisheries perspective, as they possess many unique characteristics that set them apart from other fish species. Sharks and rays both make up subclass eslasmobrachii, distinguished from the teleosts or bony fish by several fundamental factors, including skeletons made of cartilage instead of bone, sandy skin instead of scales, and internal fertilization.[13] While some sharks and rays reproduce oviparously, most shark species give birth to live young through either oviviparous or viviparous development.[14] Most species take from 10 to 15 years to reach sexual maturity, and only produce several young at once. These slow reproductive rates make sharks particularly vulnerable to over fishing.[15] Over the past 60 years, shark catches have risen dramatically with increasing demand. In 2000, one expert estimated worldwide landings at 55-100 million individuals.[16] The increasing pressure on these fragile populations has prompted mounting concern for the conservation of these animals.[17]

The Shark Fin Trade

The international shark fin trade has been an important factor in the increased targeting of sharks worldwide (see page 8). Shark fin soup has been a traditional delicacy in China for thousands of years (see page 8).[18] The fin used for this soup is a heavily traded commodity, with the focal point of the market being Hong Kong. A recent study by the Wildlife Conservation Society in New York of trade statistics indicates that the volume of fins being traded in this market may be twice as high as previous estimates, with Hong Kong importing as much as 85 percent of the world's fins.[19] Demand for shark fin soup in Asia and throughout the world continues to rise.[20] Once eaten only by the most priviledged, shark fin soup has risen in popularity among Chinese communities throughout the world, and still retains a deep cultural significance. The preparation of the

[9] Traffic, 7.
[10] Jiddawi, N.S., Shehe, M. A. (1997) 109.
[11] Barnett, 59.
[12] Barnett, 60.
[13] Richmond, 324 and 244.
[14] Taylor, p.107.
[15] Richmond, 324 and 244.
[16] "The End of the Line," p.15.
[17] Taylor, 34. *Sharks and Rays.*
[18] Taylor, 37.
[19] Taylor, 34. *Sharks and Rays.*
[20] "The End of the Line," p.9.

soup is quite complex. Fins are defrosted, blanched in hot water, and scraped of skin. The cartilage is removed in ice water, and the remaining tissue is dried and refrigerated. The final product is soaked, softened, and cooked in chicken broth. A single bowl can sell for anywhere from the equivalent of 10 to 100 American dollars.[21]

Shark Fin Trade in Zanzibar

A trade in shark fins with East Asia has been present in Zanzibar from as early as 1919, with 6.6 tons exported in 1923.[22] As of the 1960s, the fin trade in Tanzania and Zanzibar was monopolized by several East Asian businessmen, four in Tanzania, and three in Zanzibar. However, the late 1980s saw a rising competition from increasing numbers of local fin traders, resulting in a significant increase in the local price of fins.[23] Yearly legal exports since 1991 have ranged from zero to 7.85mt.[24] However, these statistics are thought to represent only a fraction of the total exports from both licensed and unlicensed traders, large numbers of the later exporting mainly to Mombasa, Kenya.[25]

Previous Research

The shark fishery in Zanzibar has not been extensively studied. A 1997 report by Jiddawi and Shehe describing overall patterns in shark catches and the shark trade in Zanzibar concluded that shark stocks were in decline due to overexploitation. In 1994, Traffic-East/Southern Africa conducted a study of "The Trade in Sharks and Shark Products in the Western Indian and Southeast Atlantic Oceans." This included an in-depth investigation of fishing practices, the fin trade, and the market for other shark products in Tanzania and Zanzibar. However, no studies so far have gathered detailed data on local shark landings. This study seeks to provide a brief yet in-depth investigation of the current state of the local shark fishery, in addition to re-assessing the fin trade and its local impact.

[21] "The End of the Line," p.9.
[22] Jiddawi and Shehe (1997), p. 109.
[23] Barnett, 39.
[24] Zanzibar Dept. of Fisheries
[25] Barnett, 58.

Map of Zanzibar Islands
http://www.ewpnet.com/trip_maps/zanzibzr.htm, accessed May 14 2004.

Shark Fins for Sale
www.thailandlife.com/food/ sharkfinsoup.html
01.04.03.html
Accessed May 14, 2004

Shark Fin Soup
www.yptenc.org.uk/.../archives/
Accessed May 14, 2004.

METHODS

Study Sites

Unguja is the larger of the two Zanzibar islands, with an area of roughly 650 square miles.[26] The fishing territory for Unguja Island alone comprises a total area of 1279km^2.[27] According to statistics from the Department of Fisheries, Unguja Island represents the vast majority of landings for all of Zanzibar. Within Unguja, the highest volumes of fish are landed in the North A District, with the second highest volume landed in the Urban District comprising Zanzibar Town.[28] The main city for both islands, Zanzibar Town is located on the western coast of Unguja with Stone Town, its old port and center, situated at the western tip of the city.

This study was carried out in the two fish markets in Stone Town: Malindi and Darajani. Malindi market is located at a seaport at the northernmost end of town. The majority of fish sold at the market are brought directly by fishing vessels from a variety of different fishing grounds around the Island. Many of these fish, including most sharks caught, are sold or bid upon right on the beach, while others are taken to a nearby enclosed market for cleaning and selling (see page 11). Darajani market is part of a larger market area located near a main road on the east side of town. While the market is an indoor one, most sharks and other large fish are bid upon outside on the street. Most of the fish sold at the market are brought on Daladalas arriving from coastal towns all over Unguja (see page 11).

Data Collection

Data were collected over the course of 23 days at both Malindi and Darajani markets. Data collection at Malindi was carried out by a beach recorder from April 16 to May 8, 2004. Data collection at Darajani was carried out by the researcher with assistance from another beach recorder from April 17 to May 9, 2004. The same data sheets were used at both markets to record the following information for each shark observed: time of arrival; species and sex of shark; number of fishermen; name of fishing ground; type of gear, bait and boat used; length, girth, and weight of shark; length and wait of fins; price of meat, fins, and/or entire shark (see Appendix 1). Where possible, direct observation of pregnant females was also noted.

Sharks at Darajani were identified by the researcher using two field guides: *The Natal Sharks Board's field guide to Sharks*, and the FAO *Field Guide: Commercial Marine and Brackish Water Species of Tanzania.* Photographs were taken of many of the sharks to further aid identification afterward. The beach recorder at Malindi identified sharks by their local names in consultation with fishermen. At the end of the study period, the English names of sharks observed at Malindi were identified by the beach recorder using field guides and photographs.

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[26] Zanzibar.net, http://zanzibar.net/zanzibar/what_is_zanzibar, acessed 5/14/04.
[27] Barnett, 41.
[28] Barnett, 45.

Information on fishing practices was gathered at Malindi by questioning the fishermen themselves. At Darajani, where possible, information was gathered through consultation with the fishermen or mongers who had brought the sharks; otherwise, knowledgeable market workers were questioned.

Length, girth, and fin size were measured using either mettle or rubber tape measures. Weight measurements at Malindi were taken using a hanging balance for those sharks small enough to lift. Weight measurements at Darajani using a small balance with a mettle tray. Due to both the difference in the types of scales used and the larger size of the sharks at Darajani, most of the weight data collected at Darajani was for fins, while at Malindi, the total weight of the shark was measured. Data on the price of fins and meat was gathered by directly observation of the auction or questioning the buyers and sellers.

Data Analysis

Data was analyzed through graphs and tables created using Microsoft Excel. Due to limited time and resource, no statistical analysis was possible, and only rough estimates could be made in order to summarize landing data over the course of the study period. Averages and proportions calculated from available data were used to estimate weights of fins and sharks where no such data was present. Specifically, weight, length, and girth data for sharks recorded at Malindi was used to calculate proportionality constants then used to estimate the weight of similar species recorded at Darajani. Similar methods were employed to estimate the weight of fins at Malindi using data collected at Darajani.

Interviews

Qualitative information on various aspects of the local shark fishery and fin trade were gathered through interviewing local fishermen and fin traders at both Malindi and Darajani. All interviews were carried out in Kiswahili via a translator using a prepared questionnaire; however, the questions were not rigidly adhered to (see Apendix 2). Field guides were used to identify the species being discussed. A total of seven fishermen were interviewed at Malindi over the course of two days, May 5 and 6, 2004. The men varied in age and therefore had varying levels of fishing experience, ranging from fifteen to forty years. A total of five traders were interviewed on three separate dates, three at Malindi and two at Darajani (these individuals are thought to represent the majority of the traders who collect fins in Stone Town). Traders at Malindi were interviewed on April 16, 2004 (names not recorded). Mr. Bakar Ali Hamis and Mr. Muhidini were interviewed at Darajani on April 25 and 29, respectively. In addition, one individual who used to export fins to Hong Kong, Mr. Ho Kokung (locally known as “Kokiau”) was interviewed in English at his place of business in the greater Zanzibar Town area. A small-scale fin collector was also interviewed at his home in Bububu. Information gathered through these interviews was supplemented through casual conversation with market workers, fin traders, and other local people over the course of the study period.

RESULTS

State of the Shark Fishery

Shark Landing Data

Species Identification

A total of sixteen different shark species were identified during this study; however, the accuracy of the identification was highly variable (see Table 1 below). Nine of the species were accurately identified in person using the field guides. Where possible, photographs of all species potentially recorded inaccurately appear in **Appendex 3**. Errors in identification while recording data were potentially made for two species: the milk shark and dusky shark. While all small species resembling the pictures in Appendix 3 were recorded as "milk shark," many among these may have in fact been the "hardnose shark," or even juveniles of other species. At Malindi, all such sharks were recorded as "kinengwe." The two sharks resembling picture 3 were noted as "dusky shark," although they also resembled the bull shark (*Carcharhinus leucas*) or java shark (*C. amboinensis*) in many aspects, including the shape of the teeth. Two species observed were unidentified altogether. The corresponding Swahili names used to identify sharks at Malindi also left room for doubt in the case of certain species (see Appendix 3 for corresponding names as identified by the beach recorder). In the case of the black tip, the beach recorder noted all sharks he observed with black-tipped fins. The nurse shark and zebra shark were identified by second-hand description only.

Table 1. Summary of all shark species identified.
Relative confidence levels are indicated for overall identification, as well as for data collected at both markets.

Common Name	**Local Name**	**Species Name**	**Confidence**	Darajani	Malindi
Angel Shark	Jiwe	*Rhina ancylostoma*	100%	100%	
Bigeye Thresher	(unknown)	*Alopias supercilliosus*	100%	100%	
Giant Guitarfish	Fuanda/Charawanzi	*Rhincobatus djiddensis*	100%	100%	100%
Milk Shark	Kinengwe	*Rhizoprionodon acutus*	100%	50%	50%
Scalloped Hammerhead	Pingusi	*Sphyrna lewini*	100%	100%	100%
Small Guitarfish	Baro Baro	*Rhinobatus sp.*	100%	100%	100%
Tiger	Nyambrani	*Galiocerdo cuvier*	100%	100%	
Hardnose Shark	Kinengwe	*Carcharhinus macloti*	75%	90%	50%
Hound Shark	(unknown)	*Triakidus sp.*	90%	75%	50%
Snaggletooth	Meno	*Carcharhinus ellioti*	100%	100%	75%
Black Spot	Sumbwi	*Carcharhinus melanopterus*	75%	75%	
Black Tip	Sumbwi	*Carcharhinus sorrah*	75%	75%	50%
Grey Reef	Sumbwi	*Carcharhinus wheeleri*	75%	75%	50%
Dusky Shark	Kitumbo	*Carcharhinus obscuris*	50%	50%	50%
Nurse Shark	Kombe	*Ginglymostomatidus sp.*	25%		25%
Zebra Shark	Ngosi/Dovai	*Stegostoma fasciatum*	25%		25%

General Population and Catch Statistics

A total of 337 sharks were recorded over the entire study period, 151 at Darajani and 186 at Malindi. As stated above, a total of 16 different species were recorded at both markets, 13 at Darajani and 9 at Malindi. Relative abundance varied greatly among species, with the small species identified as "milk shark," or "kinengwe," most abundant at both markets (see Fig. 1). "Milk shark" thoroughly dominated landings at Malindi, making up 122 of the total 186. The next most abundant species were those identified as "grey reef" (or "sumbwi") and fuanda, with 13 and 12 individuals landed, respectively. Less than 10 individuals were recorded for each other species. Relative abundance was more evenly distributed in Darajani among those individuals identified. "Milk shark," "baro baro" (small guitarfish), and black tip reef shark were the most common species at Darajani (31, 26, and 22 individuals, respectively). All other species were present in low numbers (8 or less).

In terms of daily catches, no distinct pattern could be observed with respect to tides and the lunar calendar, as daily catches for both markets fluctuated greatly and were inconsistent with each other (see Fig. 2). Peak catches at Malindi occurred on the tenth and thirteenth days of the lunar month (April 30, neap tide, and May 3, spring tide). Peak catches at Darajani occurred on the third and twelfth days of the lunar month (April 23 and May 2, both spring tide). The new moon, described by all fishermen as the best time for catching sharks and other fish, occurred on the 29th day of the lunar month, and the full moon on the 14th.

A total of eight pregnant females were observed—six and Darajani and two at Malindi. Five of these were milk sharks, observed to contain from two to five pups ranging from 10-14 in. in length (the number of young decreasing with size). Other pregnant individuals observed: a dusky shark, a black tip containing four pups, and a gray reef containing seven pups. These most likely are only a fraction of the total pregnant females landed and unobserved.

Fishing Grounds and Shark Distribution

Sharks recorded at Darajani arrived from 13 different villages, with the largest number being caught in Nungwi (46), Uroa (21), Mkokotoni (19), and Kizimkazi (18) (see Fig. 3). Sharks at recorded Malindi arrived from 27 different fishing grounds, the largest number being caught in Bara Mwambao (40), other Bara sites (28 total), and Chumbe (21). The number of different species caught at each site generally correlated with the volume of landings (see Appendix 5). For sharks recorded at Darajani, 10 different species arrived from Nungwi, and 6 from both Kizimkazi and Mkokotoni. At Malindi sharks arrived from a much larger number of sites, with no more than four or five species being caught at any one site. The most number of species were found in Bara, Bumbwini, Chumbe, M/Kuni, and Mapape. In terms of the geographic distribution of each species, the most abundant species generally had the widest distribution. This was especially true for Malindi, with milk shark landings recorded from 18 different

sites, grey reef sharks from 9 sites, and fuanda and snaggletooth from 7 sites. For Darajani, black tip and not milk shark was recorded to have the widest distribution, being landed at 8 different sites. Next cam milk shark and fuanda, landed at 6 and 4 different sites, respectively. Baro baro was the one species recorded in high numbers but exhibiting a narrow distribution. This is owing to the fact that large numbers of this species were apparently landed at once, with as much as 16 individuals arriving together from one site (Nungwi).

Exploitation of Particular Species

Detailed statistics were calculated for five selected species (see Table 2 below). For all five species, significant numbers of juveniles were landed (juveniles were identified by length using field guides). According to length measurements, all fuanda and scalloped hammerhead caught during the study period had not yet reached reproductive maturity, although some were nearly there. Most grey reef landed at Malindi were immature, while most landed at Darajani were mature. Higher proportions of females were recorded for most species, with the exception of fuanda, which was difficult to sex. Jarife, or shark net, was most commonly used to catch all species except for grey reef (these statistics were taken only from Malindi).

Table 2. Summary of Population and Fishery Statistics for Five Species

	Fuanda		**Milk**		**Grey Reef**		**Scallop.**	**Hammer**	**Tiger**
	Malindi	Darajani	Malindi	Darajani	Malindi	Darajani	Malindi	Darajani	Darajani
No. Individuals	12	18	122	31	13	5	5	6	3
No. Juveniles	12	18	25	5	12	2	5	6	2
Max Length (cm)	142	147	89	74	140	190	81	152	259
Min Length (cm)	66	107	43	36	50	86	64	56	221
Percent Female	0.20	unknown	0.59	0.58	unknown	0.60	unknown	0.66	0.5
Gear Most Used	Jarife		Jarife		Line		Jafire		Jarife
Bait Most Used	n/a		n/a		Squid				
Vessel Most Used	Mashua		Boti		Boti		Mashua		Boti/Dau

Interviews

Fishing Grounds and Distribution

Although all fishermen interviewed were from Unguja, all but one reported seeking sharks beyond local waters in Pemba and/or the mainland. The waters around Tanga and Mafia and an area called Kimbidji between Unguja and the Mainland were each mentioned by more than one fisher as particularly good grounds. One fisher reported going as far as Malindi, Kenya, which he said was an excellent site for sharks. Three fishermen said they do not fish for sharks around Unguja at all, but concentrate their effort elsewhere because yields are too low and competition from other fishers is too high in local waters. As one fisher explained, the high number of fishermen competing

for shark catches around Unguja had made sharks "to difficult to find," and sent him searching for sharks in the deeper waters around the mainland. Along the same lines, another fisher said that he only fished for sharks in Pemba in the Mkumbu area. Here he said there were still many sharks close to shore, owing to the low number of fishermen and the fact that most of them use finer-mesh nets to target smaller fish. A third fisher reported that he had ceased to target sharks altogether because there are now too few to make the effort worthwhile. He targets more valuable species, such as red snapper and changu, which fetch a higher price at the market.

Fishing Methods

All fishers reported using either gill net or long line baited with dolphin meat catch sharks. Large mesh nets (6in.) are used most often to catch large sharks, and small mesh (3-4in.) for small sharks. According to several fishers, shark size increases with depth. One fisher said that while lines baited with dolphin were the traditional gear used for sharks, the nylon nets now used are superior when facing rough seas. However, lines are still best for catching certain species, such as tiger sharks. The two fishermen asked said that they usually place their gillnets on the surface of the water. One fisher specified that placement of the net varies seasonally: the net is placed on the surface during the NE monsoon, when sharks are said to move up from the depths. In term of vessels, all fishers said they used either dau or mashua, with a range of three to seven other men.

Seasonality

Most fishermen, fin traders, and market workers I spoke to referred to the pronounced seasonal effects on shark catches in Zanzibar. Everyone said that the number of sharks in caught in local waters increases dramatically during the NE monsoon. Although the NE monsoon continues from November to March, one fin trader said that the real period of high shark catch was from January through March, and catches declined significantly by April. Many Darajani workers confirmed that the catch observed during this study was insignificant compared with several weeks prior, in terms of both number and size of sharks brought to the market.

Exploitation of Particular Species

All fishermen interviewed were asked about which species they catch in high or low numbers. All but one fisher identified "kinengwe" (milk or hardnose shark) as one of the most abundant species. "Sumbwi," identified as either snaggletooth or grey reef shark, was another species said to be caught in high numbers, especially during the NE monsoon. One fisher said that he caught many sumbwi near to shore. Angel shark, "vitumbo" (dusky shark), and "meno" (snaggletooth) were other species mentioned as abundant. Responses varied concerning the tiger shark, or "nyambrani." One fisher said he catches nyambrani with a line in the deep waters off of Kizimkazi. Another said he catches many large nyambrani, but he only fishes mainland waters. A third fisher said there are few nyambrani in Unguja waters, but many can be caught in the "Msuka" region of Pemba. The fisher who only fished in Pemba reported catching many tiger shark—as

well as “marabuy” (identified as lemon shark), hammerhead, and dusky shark—in deep waters.

When asked about which shark species they see most rarely, most fishermen pointed to the sawfish, or “papa upanga.” One fisher with forty years experience said he had only seen nine individuals in his whole life. Another fisher for forty years said he used to catch many, but now there are very few. This man specified that these sharks are caught using a net, not line. The hammerhead, or “papa pingusi,” was another species said to be rare and/or declining. One fisher said that you might see only one during a good season. Another species mentioned by only one man to have declined significantly was “mambwe”—his description seemed to match the great white shark. One fisher mentioned “mwisho” as a rare species (this was not identified).

Fishers were questioned in more depth about the giant guitarfish, of particular interest due to the high value of its fins. Local names for this species include “fuanda,” “charawanzi,” “baro baro,” and “jozi,” with usage varying regionally (baro baro is used locally for smaller guitarfish species). Fuanda and charawanzi are the most common names used in Stone Town. Four fishermen reported that they catch this species in high numbers; however, two said that numbers are declining. Two other fishers named fuanda as a rare species—one said that this was because so many people were catching it for its fins. In terms of fishing methods, responses varied: one fisher said that he catches fuanda with either a line or net, while two others said that only a net is used, placed in the bottom waters where faunda are said to dwell (especially near coral reefs). Responses also varied concerning the depths at which this species are caught. While describing methods for targeting this species, fishers questioned did not appear to focus their efforts on catching fuanda.

Changes in Shark Stocks Over Time

Both fishermen and traders were asked about whether they had observed any changes in the numbers of sharks being caught over the years. On the part of the fishermen, four of the seven reported changes in stocks. Only one fisher reported catching more sharks than in the past (particularly fuanda, kinenge, and sumbwi). The three others all reported a significant decline for all species since they had begun fishing. One among these three said that sharks are very difficult to catch nowadays, especially close to shore. Another said that sharks are moving to deeper and deeper waters to “escape” the rising numbers of fishermen targeting them. The third man agreed that the decline was due to the increasing numbers of fishermen, and said that he had stopped targeting sharks all together.

Response varied among the local fin traders. Two only pointed to the seasonal changes in shark numbers, while two others said there had been a consistent decline in numbers over time for all species. The fin exporter interviewed also said that shark catches in both Zanzibar and mainland Tanzania have dwindled due to overexploitation.

The Market for Shark Products

Table 3. Market Statistics for Five Selected Species

	Fuanda		Milk		Grey Reef		Scallop.	Hammer	Tiger
	Malindi	Darajani	Malindi	Darajani	Malindi	Darajani	Malindi	Darajani	Darajani
Total Catch (kg)	102	87	242	52	54	86	22	60	unknown
Total Wt of Fins (kg)	6.6	6.5	40	10	9.2	15.9	unknown	unknown	unknown
Av. Price: Meat	9800	13500	2000	1900	2000	1500	3200	24200	37000
Av. Price: Fin	4800	17800	unknown	500	11000	18000	unknown	33500	50000
Av. Price Meat/kg	1200	2800	1000	1130	600	9600	700	2420	unknown
Av. Price Fin/kg	9000	20500	unknown	15000	6400	4900	unknown	unknown	18500

Shark Meat: Value and Export

As could be readily observed at the markets, shark meat is widely consumed in Zanzibar by local people. Many market workers said that they enjoy eating shark. The value and quality of meat was also said to vary by species. "Kinengwe" was said by many to be particularly good to eat, in addition to fuanda. Tiger shark meat was said to be poor in quality (one fisherman interviewed said that this was because the meat was watery and little meat was left over after boiling). However, the meat of all sharks caught was sold for local consumption, apparently without exception.

According to data collected at the markets, the value of meat varied considerably among species (see Table 3, above). Average price was unsurprisingly a reflection of the size of sharks landed—tiger shark therefore had the highest price because the individuals caught were largest, followed by fuanda and hammerheads landed at Darajani. Looking at the actual value of meat per kg, grey reef at Darajani had the highest value, but ones caught at Malindi had the lowest. Prices at Malindi were consistently lower for meat than at Darajani. Prices for fin were significantly higher than meat for almost all species. For fuanda caught at Darajani, the estimated value by weight of fins was nearly ten fold higher than for meat, although fuanda meat fetched higher prices at Malindi. Aother exception was the grey reef landed at Darajani, which fetched higher priced for meat.

Shark meat is only occasionally exported from Zanzibar. Aside from over one ton of meat exported in 1991, trade statistics show that meat export has been nearly nonexistent over the past ten years (cite fisheries dept). During that year, export value for meat was approximately 245 Tsh/kg, in contrast to nearly 400Tsh/kg for fins exported.

Value of Fins

As is evident from the recorded data, value of fins varies widely by both size and species. Fuanda was recognized by all fin traders as the most valuable shark species. Its fins were said by all to be worth 150 or 160,000 Tsh/kg, roughly twice the value of the fins of all other species. Mr. Ho Kokung explained that the high value of Fuanda is due

to the fact that its fins are highly productive for the "threads" used to make fin soup. According to all traders and several fishers, prices of most other species were roughly equal. Traders reported a range of 70-85,000Tsh/kg for these fins. The tiger shark in particular was singled out by both fishers and traders as a species with low quality fins. Prices for tiger fins reported ranged from 35-50,000Tsh/kg. Mr. Ho Kokung explained that this was because tiger shark fins contained a lot of "sand, bone, and skin," but few "threads." Another species of low value mentioned by Mr. Hamis was "komba," or angel shark. Mr. Ho Kokung said that some shark species are not valuable for their fins at all, including the basking shark.

In addition to varying by species, the value of fins also varies by size. The variations in value by size were explained by Mr. Hamis. Mr. Hamis said that all fins were sold, no matter how small or immature. There are four size categories, which he indicated with using a tape measure: 7in. and below, 7-20, 10-15, and 15 and above. For fuanda, prices range from 45-150,000/kg. For other species, prices range from 10-75,000/kg. There is also a discrepancy between the dry and wet value of fins, since fins lose most of their weight once dried. According to the exporter interviewed in Bububu, the price for 4kg wet fin is equal to that of 1.8kg dry fin.

When questioned about the relative value of species, all fishermen interviewed also recognized Fuanda for its fins rather than meat (although one fisher said that the meat is also valuable). Four fishers said they sell fins, but one said that he often sells the shark whole. Indeed, at Malindi, many of the smaller species such as "sumbwi" and "kinengwe" were sold whole by fishermen, and the mongers buying the sharks were the ones selling the fins to traders. This was also observed at Darajani, mainly for smaller sharks. The others reported varying ranges of prices they had gained for a set of fins, ranging from 120,000 for black fin up to 300,000 for a large fuanda. Mr. Hamis said that he generally pays the fishermen 10,000 Tsh less than its value, but gains a larger profit for fuanda fins (up to 50,000Tsh).

Local Fin Trade and Export

Five fin traders were identified who frequent the Malindi and Darajani markets. These men have been engaged in the trade for 10-20 years. None of them exports fins personally; rather, they sell their fins to local exporters or collectors. The three traders asked said that they also visit "the shambas" (coastal villages) throughout Unguja to collect fins. Both traders interviewed at Darajani also said that they collect fins from mainland Tanzania and Mafia. One trader, Mr. Muhidini, said that he employs thirty fishermen to catch sharks in mainland and mafia waters. He pays for their gears and boats, then follows them to the site to collect the fins, which he said he buys at a very low price. The fishermen then sell the rest of the shark.

The local traders identified by name a total of nine exporters on Unguja with whom they do business: five local Zanzibaris, and four Chinese men who export to Hong Kong. According to one fin trader, the Zanzibari collectors export mainly to Mombasa, although one may have visited Hong Kong twice (due to logistical constraints, none of

the Zanzibari traders could be interviewed). All four Chinese exporters are based in the greater Zanzibar Town area. The collector interviewed in Bububu does not export fins himself, but sends them to Dar es Salaam, where his uncle has been exporting fins for 30 years. He currently collects a low volume of fins, only 10kg/month in the low season and 60kg/month in the high season (10kg for white fin).

The other collector interviewed, Mr. Ho Kokung, exported fins from Zanzibar for 10-12 years, but has ceased to do so for the past four years. Mr. Ho Kokung said that during his early days in the trade, exported as many as one ton of fins per year; however, only a small percentage of these were from sharks caught in Zanzibar. He said that the majority of the fins he collected came from sharks caught along the Southern coast of mainland Tanzania and Mombasa. In the early days, he said he also collected many fins from the Comoro Islands and Somalia. However, he said that the trade between North Africa and East Asia had been taken over by the United Arab Emeritus. He also said that he had faced increasing competition from local fin traders, and that this factor combined with decreasing local shark production had driven him out of the business.

Zanzibar Department of Fisheries statistics for export of marine products over the past thirteen years show an export in 1991 of nearly 8 tons of fin (see Fig 4). Recorded export volume for fins declined until 1994, and no recorded fins were exported in 1995. After that year, exports rose to a peak in 1998 at around 7 tons, then declined again until 2000. Exports for last year were slightly over one ton. Almost all fins exported go to Hong Kong, and a revenue of 5% is paid to the Department of Fisheries.[29] It should be noted that these records do not include any fins exported illegally, and as Mr. Ho Kokung hinted, it is likely that many of the local traders may export without licenses. The trade statistics also fail to show how much of the fin is from sharks caught in Zanzibar itself.

All traders interviewed reported that the value of fins has risen over the years with increasing demand from abroad. This observation is concurrent with the trade statistics, which show a general increasing trend in the value of fins exported over the past ten years (see Fig 5).

Other Shark Products

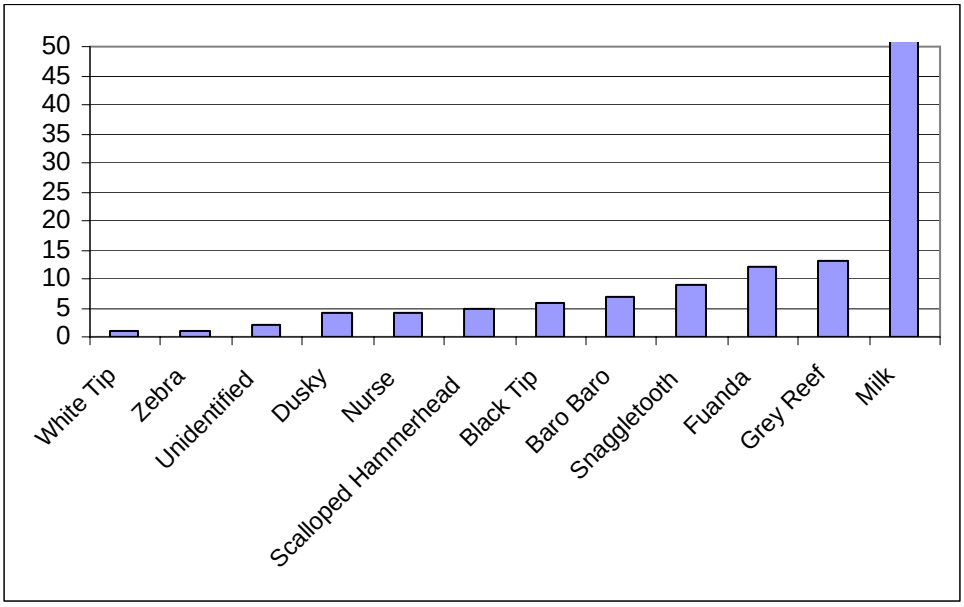
Besides meat and fins, another part of the shark always utilized is the liver, collected for its oil or "mafuta." This mafuta is collected in jugs and left to "ripen" for two or three weeks, after which it is used as a varnish for boats (local name "sefa").[30] According to two fishermen, they often collect the "mafuta" for their own use, but will also sell it if possible. Mafuta is also occasionally exported form Zanzibar, mainly to Mombasa, Somalia, or Madagascar.[31] Only a very minimal and incidental curio trade was observed at Darajani, despite the arrival of many large sharks. Jaws were usually split in half as the shark was cleaned. Jaws were observed being cleaned and saved whole on only one occasion (these were taken from a large snaggletooth). The man

[29] Mr. Juma Omar, pers. comment, Dept. of Fisheries and Marine Resources, Office for Marine Products, May 11 2004.
[30] Haji Makame, pers. comment, Darajani, April 17.
[31] Mr. Juma Omar, pers. Comment.

preparing them said they might be sold for 10,000 Tsh. One seller had been keeping a set of tiger shark teeth for the past three months, in hopes of eventually selling them to tourists.

RESULTS: FIGURES

Malindi



Darajani

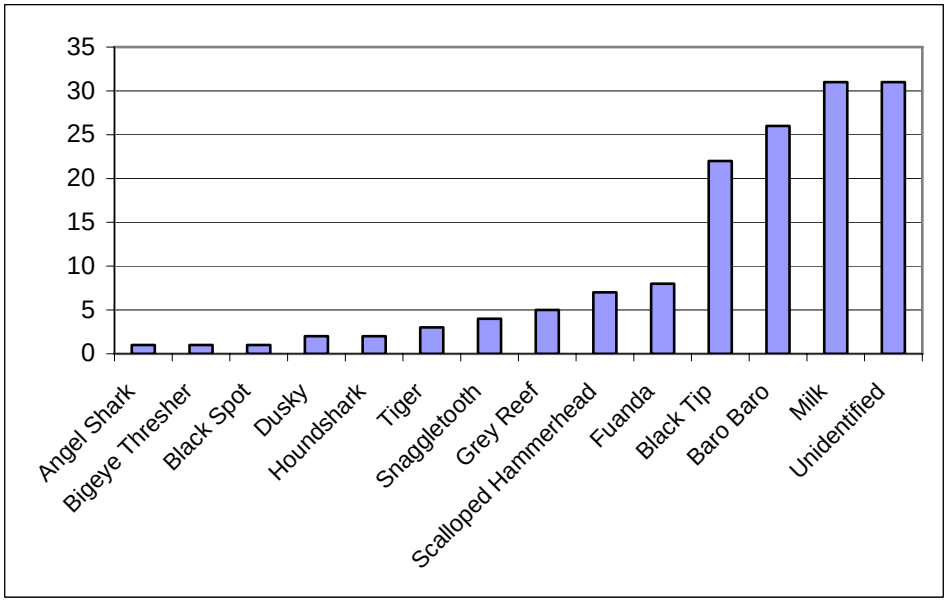


Fig. 1. Observed relative species abundance for Malindi and Darajani markets (by total number of individuals landed).

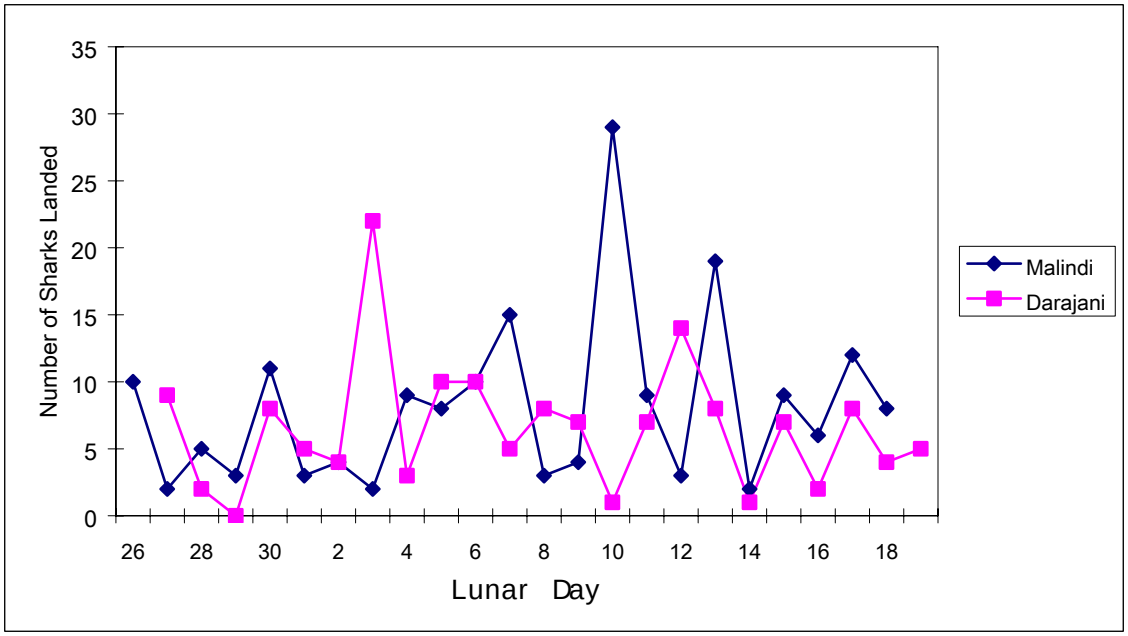
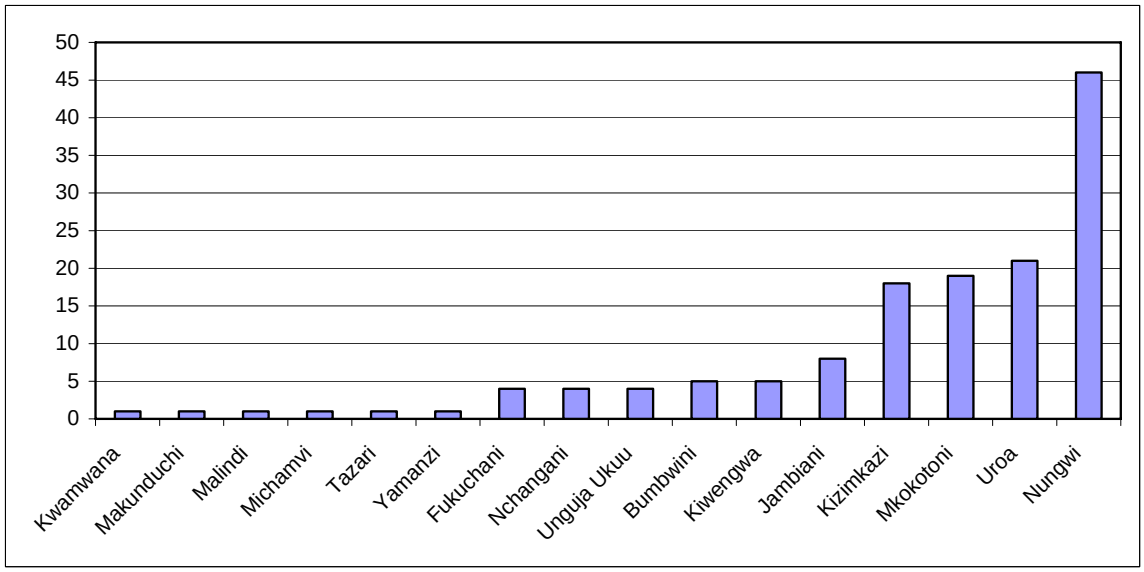
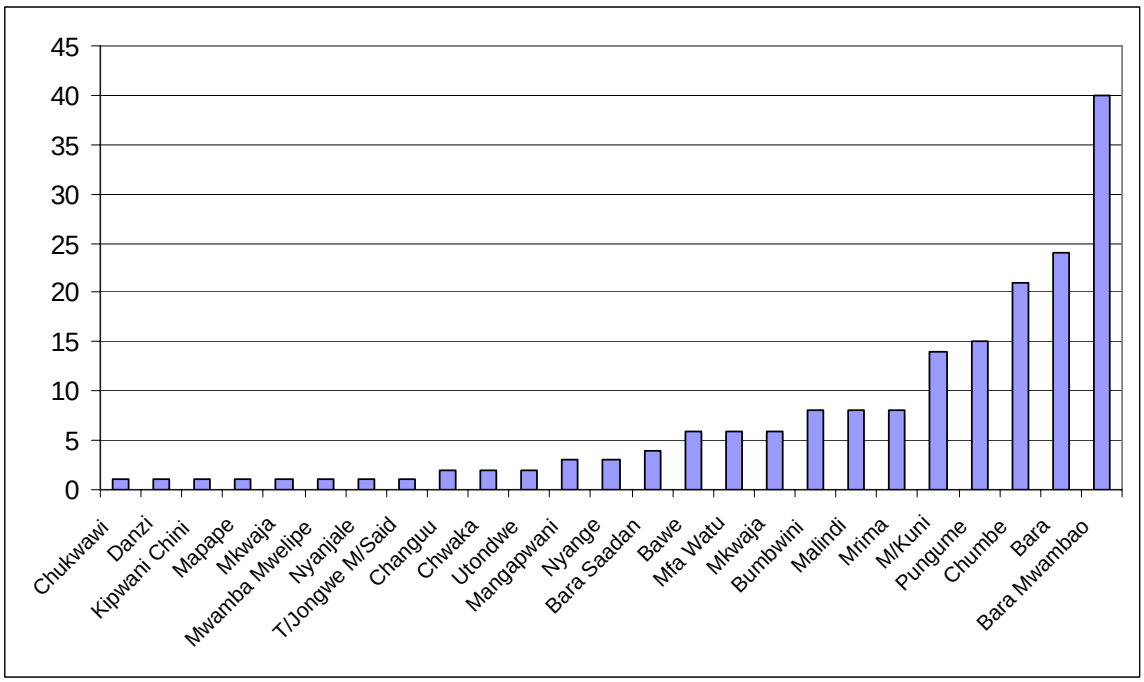


Fig. 2. Daily total shark landing for each market by lunar calendar days.
Day 26 corresponds to April 26, and day 19 to May 9. New moon and full moon are indicated, in addition to spring and neap tides.



Darajani



Malindi

Fig. 3. Total catch by fishing ground for Malindi and Darajani markets.

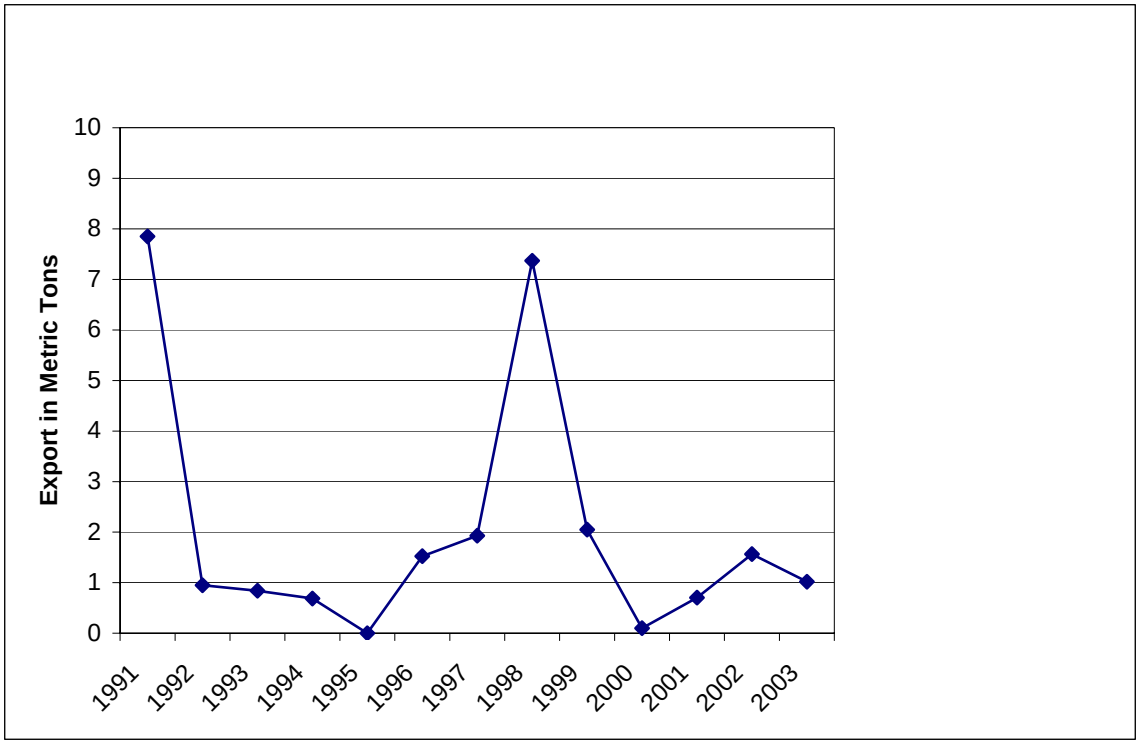


Fig. 4. Zanzibar: yearly export of shark fin in metric tons from 1991-2003.
Data courtesy of the Zanzibar Dept. of Fisheries and Marine Resources: Office for Marine Products.

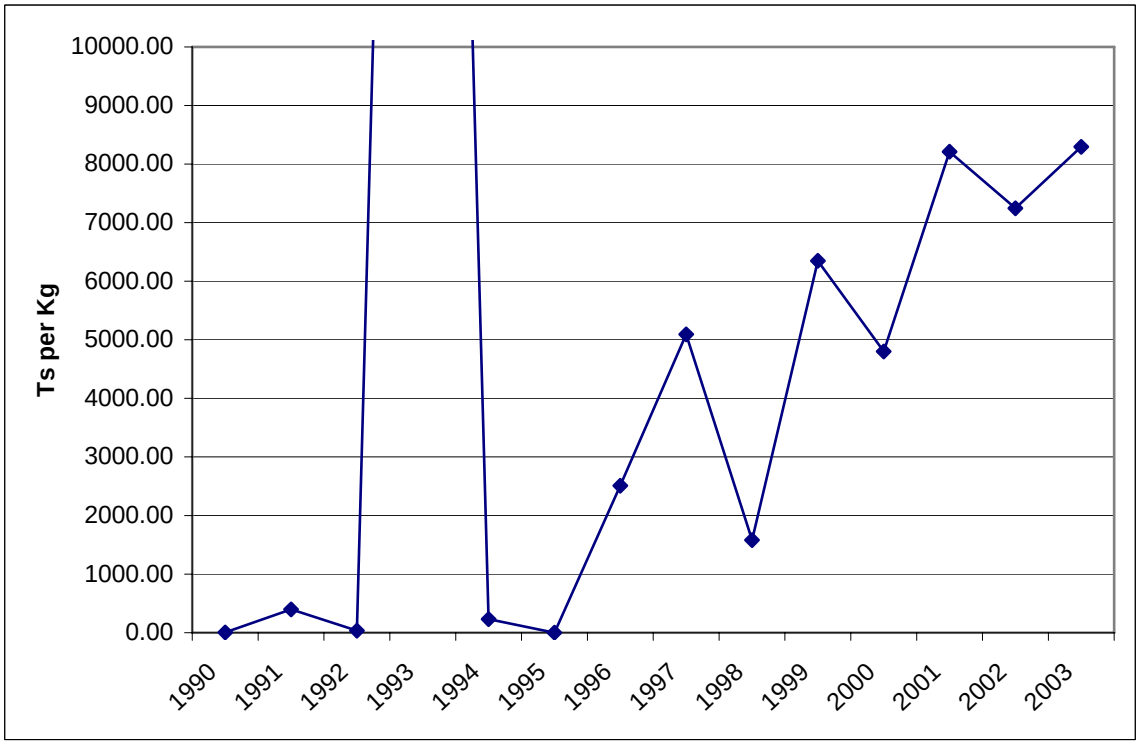


Fig. 5. Zanzibar: changes in value of shark fin exported from 1990-2003.
One anomalously high value of over 43000 Ts in 1994 is not shown.

DISCUSSION

Zanzibar Shark Stocks: Current Status

Due to the short period of this study, most conclusions about the current status of shark stocks can be drawn only from interviews. More extensive data is available from the Zanzibar Fisheries Department, which records monthly data on the local landings; however, statistics for sharks and rays are combined. According to the 1995 Traffic Report, these statistics may represent only the minimum catch estimate.[32] Statistics for 1989 to 1995 show a gradual increase for the first five years from with a single large peak in 1994 at nearly 1000 metric tons. Landings for this seven-year period ranged between around 100 to 300 tons (see Appendix 6). Landing statistics for the past five years are significantly higher, ranging from nearly 900 to over 1200 tons. After a slight decline in 2001, the statistics show an increase to the highest catch for the past five years in 2003.

This information would seem to contradict the conclusions drawn from the interviews, which seemed to indicate declining catches; however, the breakdown between sharks and rays must be known. According to one study of Zanzibar fishing grounds, rays were found to represent the majority of the elasmobranch catch.[33] It may be worth noting that one fisher specified during an interview that he catches more sharks than rays. On the other hand, if shark catches are indeed higher, this may be attributable to the higher numbers of fishermen that the interviewees attested to.

The picture presented by fishermen and traders of the current state of the Zanzibar shark fishery appears to be a highly accurate one. It is a worldwide-documented phenomenon that artisanal fisheries, while small in scale, can put significant pressure on local populations because they are restricted to and concentrated in coastal waters. [34] Three fishermen emphasized that coastal Unguja waters were overexploited by too many fishermen, driving sharks to deeper waters and different grounds. Many of the fishermen interviewed reported seeking sharks in mainland waters mentioned low catches and too much competition in Zanzibar waters as a factor. Mr. Ho Kokung also commented that Zanzibar territorial waters are too shallow and small in area to provide significant shark catches, and therefore easily depleted by heavy competition among fishers. The comparison of one fisherman between Unguja and Pemba was particularly telling on this point, indicating that Unguja waters are depleted in comparison to Pemba, where fishing effort is low and inshore stocks remain high. While the over fishing of inshore grounds is of particular concern for those species inhabiting shallower waters, impact on overall shark populations is limited by the fact that many shark species are widely distributed both inshore and offshore.[35] However, this is of little consolation to local fishermen, mongers, traders, and consumers relying on inshore stocks for their food and livelihoods.

[32] Barnett, 44.
[33] Barnett, 45.
[34] Taylor, “Sharks and Rays”, p.39.
[35] Taylor, “Sharks and Rays”, p.39.

Beyond the impacts on the local shark fishery itself, the depletion of coastal shark stocks could have far reaching consequences for the entire fishery. Sharks, being top carnivores, are thought to play a particularly important role in maintaining the health and stability of the marine food web. Like other apex predators, sharks are likely to increase genetic fitness of smaller fish species by culling unfit individuals. [36] Yet the precise impacts of the decline in sharks on ocean ecosystems are not well understood. Several studies in ecological modeling have predicted various outcomes from the removal of sharks from the food web. One study predicted a decline in major prey species, while another predicted a boom and bust cycle for a wide range of species. A third, the "Hawaiian Reef Model," found that the removal of tiger sharks would result in declines in valuable fish species such as tuna.[37] Such potential impacts to other even more valuable fisheries should be taken into account in considering the value of shark conservation.

The Fin Trade and its Impacts

The issue of conservation in Africa and other developing countries brings to bear the relationship between local and commercial exploitation of natural resources. The introduction of market forces from abroad can often result in much greater pressure being placed on resources that once were exploited relatively sustainably for local use.[38] In Zanzibar, it is unlikely that the fin trade itself can be pinpointed as the sole factor increasing pressure on local shark populations. Given the ongoing local market for shark meat, the increase in coastal population and numbers of fishermen alone could be blamed for any decline in local stocks. However, the high value of fins compared to meat and the discrepancies in value between different species may be important factors in influencing fishing effort and activity. While shark meat is never wasted or discarded, a more directed effort may be placed on targeting sharks than would be the case were the fin trade absent. Contracts between fin traders like Mr. Muhidini and fishermen are an example of a direct link between the shark fin trade and shark-directed fishing effort.

The most likely potential impact of the fin trade may be the overexploitation of the Giant Guitarfish. Although the meat of this species appears to be on the more valuable side, it is dwarfed by the high prices that one set of large fins can fetch. Mr. Ho Kokung's observations of a worldwide decline in fin production are supported by study of 2001 trade statistics showing a decrease in the volume of shark fin imported by Hong Kong as well as worldwide.[39] As stocks declines, the demand for shark fin rises abroad and with it the market value of fins, creating yet a stronger incentive for fishermen to increase direct pressure on sharks. Compounded with the rising coastal populations, it seems unavoidable that exploitation will reach unsustainable levels, and indeed may have already.

[36] "The End of the Line," p.6.
[37] "The End of the Line," p,11.
[38] Dr. Kim Howell, personal comment, April 2 2004.
[39] Handwerk, Brian.

Market for Other Shark Products

Based on this study, the sale of both mafuta and curio products was too minimal to have any real significance with regard the overall market for sharks and exploitation of shark stocks. The curio trade is of most significance with regard to the sawfish, whose jaws were observed being sold for 40,000 Tsh at a Dar es Salaam market. The presence of such a market may clearly be having a negative impact on this already rare species.

CONCLUSION

This report provides only the most preliminary insight into the current state of the shark fishery in Zanzibar waters. However, the information gathered here sheds light on the potential problems that may arise from unmanaged exploitation. The high proportion of juveniles being caught are of particular concern, as are the frequent landings of pregnant females. Given the reports of declining stocks, it is clear that much more needs to be done to manage this uniquely vulnerable population for the sake of the local people depending upon it.

However, before regulatory measures can be undertaken, the biology of local shark populations must be well understood. The data gathered in this study provides only a limited picture of the population biology of local sharks. Furthermore, the accuracy of species identification for this project suffered on a number of counts. First of all, accurate species identification is a skill requiring extensive knowledge and training, and neither the researcher nor the beach recorders were adequately prepared in this regard. Secondly, both field guides used were inadequate in terms of both the numbers of species they displayed and the quality of the drawings. As stated by Brett Human, a shark researcher, very little is known about the taxonomy of sharks in East African waters.[40] In order for proper conservation measured to be taken, the taxonomy of local species needs to be studied in much greater depth, in addition to the reproductive and behavioral patterns of individual species.

As Mr. Ho Kokung commented, the shark fishery in Zanzibar waters may be relatively insignificant on the global scale. Yet this fishery is far from insignificant for the local inhabitants of Zanzibar, who depend upon it for their food and livelihoods. Furthermore, as Mr. Kokung also stated, the decline in sharks is not specific to Zanzibar, but appears to be a global phenomenon. Studies conducted in this region are therefore of far-reaching in their relevance to threatened shark populations worldwide. The same is true for the local fin trade. The rising price and demand for shark fin has introduced a powerful market force into the traditional fisheries sector, and the potential consequences must be understood and addressed to ensure that the world's poorest communities will not be the ones to bear the fallout from an irresponsible industry.

[40] Pers. comm., April, 2004.

RECOMMENDATIONS

The first step to be taken in improving management of local shark stocks is far more detailed monitoring of catches. According to the 1995 Traffic Report, the seasonality of the fishery limits the extent to which sharks are directly targeted, as the fishermen do not find it worthwhile to seek sharks during the low season.[41] Through speaking to fishermen, it does indeed appear that this is the period during which sharks are targeted. A year-long study would therefore be needed to gain an accurate picture of local shark stocks and fishing practices. If such a study were to be conducted, patterns of reproduction could also be studied from a seasonal standpoint, looking at variations in the number and distribution of pregnant females and juveniles. Sharks in Zanzibar waters could also be tagged to monitor migratory patterns. Also, for the purpose of future monitoring, beach recorders should be adequately educated in how to identify species and take accurate field notes.

According to interviews, species that may require special monitoring are the scalloped hammerhead and sawfish. Particular care should also be taken to monitor the Giant Guitarfish for potential declines in numbers and sizes of individuals caught. This study failed to arrive at any conclusions about whether or not fishermen are indeed targeting this species for its fin alone. However, a much more thorough survey of local fishermen would be valuable in helping to identify this and other potential impacts of the fin trade. The fin trade should continue to be closely monitored and the need for any further restrictions assessed.

Lastly, it would be beneficial to conduct an assessment of the extent of knowledge and awareness of shark biology among local people, especially the fishers themselves. Identifying any specific education needs would be useful in laying out the groundwork for a cooperative conservation effort involving the local fishing communities of Unguja Island.

[41] Barnett, 42.

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MARKET	DATE	NO SHARK	NOTES	SPEC	SEX	FISHER	GROUND	GEAR
	4-May	1	?	?	F	3	Pungume	Line
	5-May	6	?	?	F	4	Pungume	Long Line
	16-Apr	4		Baro Baro			Malindi	Jarife
	17-Apr	1		Baro Baro		3	Malindi	Line
	19-Apr	1		Baro Baro		5	Nyange	Jarife
	20-Apr	8		Baro Baro		1	Changuu	Line
	26-Apr	10		Baro Baro	M	2	Bawe	Line
	29-Apr	1		Baro Baro		3	Kwale	Line
	2-May	1		Baro Baro		3	Bawe	Line
Malindi	16-Apr	1		Black Tip			Malindi	
	2-May	2		Black Tip	F	3	Bara	Line
	3-May	2		Black Tip		4	Kwaja	Jarife
	4-May	2		Black Tip	M	3	Pungume	Line
	6-May	4		Black Tip	M	4	Bara Saad	g Line
	6-May	5		Black Tip	M	4	Bara Saad	g Line
	16-Apr	7		Dusky		5	Mapape	Jarife
	16-Apr	10		Dusky		5	Mapape	Jarife
	7-May	7		Dusky	F	3	Bumbwini	Line
	7-May	8		Dusky		3	Bumbwini	Line
	30-Apr	11		Fuanda	M	4	Mrima	Jarife
	18-Apr	4		Fuanda		5	M/Kuni	Jarife
	16-Apr	9		Fuanda		5	Mapape	Jarife
	27-Apr	9		Fuanda	F	3	Bumbwini	Line
	19-Apr	2		Fuanda		3	Mapape	Line
	21-Apr	1		Fuanda		3	Bumbwini	Line
	6-May	2		Fuanda		4	Bara Saad	Long Line
	24-Apr	8		Fuanda		6	Mkwaja	Jarife
	27-Apr	13		Fuanda	M	3	M/Kuni	Line
	6-May	6		Fuanda	M	3	Utondwe	g Line
	27-Apr	12		Fuanda	M	5	Utondwe	Jarife
	1-May	9		Fuanda		18	Chwaka	Nyavu
	16-Apr	3		Grey Reef		3	Chwaka	Jarife
	17-Apr	2		Grey Reef		3	Bumbwini	Line
	18-Apr	3		Grey Reef		5	Chumbe	Jarife
	19-Apr	3		Grey Reef		5	Nyange	Jarife
	21-Apr	2		Grey Reef		5	Mwamba M	Jarife
	24-Apr	4		Grey Reef		3	Chukwawi	Line
	25-Apr	3		Grey Reef		3	Chumbe	Line
	25-Apr	4		Grey Reef		3	Chumbe	Line
	27-Apr	5		Grey Reef	F	3	Pungume	Line
	28-Apr	1		Grey Reef	F	3	Bawe	Line
	29-Apr	4		Grey Reef		8	"T/Jongwe	Jarife
	1-May	2		Grey Reef	F	3	Bara Mwar	Line
	8-May	1		Grey Reef		3	Chumbe	Line
	16-Apr	2		Milk			Chumbe	Line
	16-Apr	5		Milk			Mangapwa	Line
	16-Apr	6		Milk		3	Bumbwini	Line
	18-Apr	1		Milk		5	Changuu	Jarife
	18-Apr	2		Milk		3	M/Kuni	Line
	18-Apr	5		Milk		3	Nyange	Line

20-Apr	1	Milk	F	3	Pungume	Line
20-Apr	2	Milk	F	3	Pungume	Line
20-Apr	3	Milk	F	3	Pungume	Line
20-Apr	4	Milk	F	3	Pungume	Line
20-Apr	5	Milk	F	3	Chumbe	Line
20-Apr	6	Milk	F	10	Mfawatu	Nyavu
20-Apr	7	Milk	F	3	Nyanjale	Line
20-Apr	9	Milk	M	3	Vijamba/Ml	Line
20-Apr	10	Milk	F	3	Vijamba/Ml	Line
20-Apr	11	Milk	F	3	Vijamba/Ml	Line
21-Apr	3	Milk		5	Mapape	Jarife
22-Apr	1	Milk		3	Kipwani Ch	Line
22-Apr	2	Milk		3	Kipwani Ch	Line
22-Apr	3	Milk		3	Bumbwini	Line
22-Apr	4	Milk		3	Bumbwini	Line
23-Apr	1	Milk	F	3	Chumbe	Line
24-Apr	1	Milk	M	5	Bara Mwar	Jarife
24-Apr	2	Milk	F	5	Bara Mwar	Jarife
24-Apr	3	Milk	M	5	Bara Mwar	Jarife
24-Apr	5	Milk	M	3	Mfawatu	Jarife
24-Apr	6	Milk	M	3	Mfawatu	Jarife
25-Apr	1	Milk		3	Pungume	Line
25-Apr	2	Milk		3	Pungume	Line
25-Apr	5	Milk		3	Mwambao	Line
25-Apr	6	Milk	M	2	Bawe	Line
25-Apr	7	Milk	F	2	Bawe	Line
26-Apr	1	Milk		3	Pungume	Line
26-Apr	2	Milk		3	Pungume	Line
26-Apr	3	Milk	M	3	Chumbe	Line
26-Apr	4	Milk	F	3	Chumbe	Line
26-Apr	5	Milk	M	3	Chumbe	Line
26-Apr	6	Milk	M	3	Chumbe	Line
26-Apr	7	Milk		3	Chumbe	Line
26-Apr	8	Milk	F	3	Chumbe	Line
26-Apr	9	Milk	M	3	Chumbe	Line
27-Apr	1	Milk	F	3	Kwale	Line
27-Apr	2	Milk	F	3	Kwale	Line
27-Apr	3	Milk	F	3	Kwale	Line
27-Apr	4	Milk	M	3	Kwale	Line
27-Apr	6	Milk	F	3	Kwale	Line
27-Apr	7	Milk	M	3	Kwale	Line
27-Apr	8	Milk	M	3	Kwale	Line
27-Apr	15	Milk	F	3	M/Kuni	Line
29-Apr	3	Milk		3	Bara Mwar	Line
30-Apr	1	Milk	M	3	Pungume	Line
30-Apr	2	Milk	F	8	Bawe	Line
30-Apr	3	Milk	M	3	Bara	Line
30-Apr	4	Milk	F	4	Mrima	Jarife
30-Apr	5	Milk	F	4	Mrima	Jarife
30-Apr	6	Milk	M	4	Mrima	Jarife
30-Apr	7	Milk	F	4	Mrima	Jarife

30-Apr	8		Milk	F	4	Mrima	Jarife
30-Apr	9		Milk	M	4	Mrima	Jarife
30-Apr	10		Milk	M	4	Mrima	Jarife
30-Apr	15		Milk	F	5	Bara Mwar	Jarife
30-Apr	16		Milk		5	Bara Mwar	Jarife
30-Apr	17		Milk		5	Bara Mwar	Jarife
30-Apr	18		Milk		5	Bara Mwar	Jarife
30-Apr	19		Milk		5	Bara Mwar	Jarife
30-Apr	20		Milk		5	Bara Mwar	Jarife
30-Apr	21		Milk		5	Bara Mwar	Jarife
30-Apr	22		Milk		5	Bara Mwar	Jarife
30-Apr	23		Milk		5	Bara Mwar	Jarife
30-Apr	24		Milk		5	Bara Mwar	Jarife
30-Apr	25		Milk		5	Bara Mwar	Jarife
30-Apr	26		Milk		5	Bara Mwar	Jarife
30-Apr	27		Milk		5	Bara Mwar	Jarife
30-Apr	28		Milk		5	Bara Mwar	Jarife
30-Apr	29		Milk		5	Bara Mwar	Jarife
1-May	3		Milk	M	5	Bara	Jarife
1-May	4		Milk		5	Bara	Jarife
1-May	5		Milk		5	Bara	Jarife
1-May	6		Milk		5	Bara	Jarife
1-May	7		Milk		5	Bara	Jarife
1-May	8		Milk		5	Bara	Jarife
2-May	3		Milk		3	Kwale	Line
3-May	3		Milk		5	Bara Mwar	Jarife
3-May	4		Milk		5	Bara Mwar	Jarife
3-May	5		Milk		5	Bara Mwar	Jarife
3-May	6		Milk		5	Bara Mwar	Jarife
3-May	7		Milk		5	Bara Mwar	Jarife
3-May	8		Milk		5	Bara Mwar	Jarife
3-May	9		Milk		5	Bara Mwar	Jarife
3-May	10		Milk		5	Bara Mwar	Jarife
3-May	11		Milk		5	Bara Mwar	Jarife
3-May	12		Milk		5	Bara Mwar	Jarife
3-May	13		Milk		5	Bara Mwar	Jarife
3-May	14		Milk		5	Bara Mwar	Jarife
3-May	15		Milk		5	Bara Mwar	Jarife
3-May	16		Milk		5	Bara Mwar	Jarife
3-May	17		Milk		5	Bara Mwar	Jarife
3-May	18		Milk		5	Bara Mwar	Jarife
3-May	19	Pups	Milk	F	5	Bara	Jarife
5-May	1		Milk	F	3	Bara	Line
5-May	3		Milk	F	5	Bara	Jarife
5-May	4		Milk	M	5	Bara	Jarife
5-May	5		Milk	M	5	Bara	Jarife
5-May	7		Milk		4	Pungume	Long Line
5-May	8		Milk	M	4	Pungume	Long Line
5-May	9		Milk	M	4	Pungume	Long Line
6-May	3		Milk	F	4	Bara Saad	g Line
7-May	1		Milk	F	5	Chumbe	Jarife

7-May	2		Milk	F	5	Chumbe	Jarife
7-May	3		Milk	F	5	Chumbe	Jarife
7-May	4		Milk	F	5	Chumbe	Jarife
7-May	6		Milk	F	3	Bara	Line
7-May	9		Milk		5	M/Kuni	Jarife
7-May	10		Milk	M	3	Bara	Jarife
7-May	11		Milk	M	3	Bara	Jarife
7-May	12		Milk	M	3	Bara	Jarife
8-May	2		Milk		3	Chumbe	Line
8-May	3		Milk		3	Chumbe	Line
8-May	4		Milk		5	Bara	Jarife
8-May	5		Milk	F	5	Bara	Jarife
8-May	7	Pups	Milk	F	5	Bara	Jarife
8-May	8		Milk		5	Bara	Jarife
25-Apr	8	?	Nurse		1		Line
28-Apr	2	?	Nurse	M	2	M/Kuni	Line
28-Apr	3	?	Nurse	M	2	M/Kuni	Line
5-May	2		Nurse	M	3	Chumbe	Line
24-Apr	7		Scalloped I	M	5	Bara Mwar	Jarife
30-Apr	12		Scalloped	Hammerhea	5	Bara Mwar	Jarife
30-Apr	13		Scalloped	Hammerhea	5	Bara Mwar	Jarife
30-Apr	14		Scalloped	Hammerhea	5	Bara Mwar	Jarife
8-May	6		Scalloped I	F	5	Bara	Jarife
16-Apr	8		Snaggletooth		5	Mapape	Jarife
23-Apr	2		Snaggletooth		5	Mfa Watu	Jarife
27-Apr	10		Snaggletoc	M	5	Mfawatu	Jarife
27-Apr	11		Snaggletoc	M	8	Bara	Jarife
27-Apr	14		Snaggletooth		3	M/Kuni	Line
29-Apr	2		Snaggletooth		5	Danzi	Jarife
3-May	1		Snaggletooth		3	M/Watu	Line
6-May	1		Snaggletooth		3	Chumbe	Line
7-May	5		Snaggletoc	M	3	Bara	Line
1-May	1	?	White Tip	M	3	Kwale	Line
24-Apr	9	?	Zebra		5	Bara	Jarife

BOAT	BAIT	LENGTH(c	GIRTH(cm	WT(kg)	FinWt (kg)	PRICE(Tsh	MEAT	FIN
Boti	Squid	76.2	40.64	6		5000		
Mashua	Squid	116.84	71.12				9000	4000
Mashua		71.12	0	1		500		
Boti	Squid	68.58	20.32	1		500		
Mashua		71.12	20.32	1		500		
"MTumb"	Squid	60.96	17.78	1		500		
"MTumb"	Squid	63.5	17.78	0.9		400		
Boti	Squid	63.5	17.78	0.8		300		
Boti	Squid	60.96	17.78	0.5		400		
		104.14	57.5	16			5000	
Boti	Squid	63.5	35.56	4		3300		
Mashua		81.28	40.64	7		3500		
Boti	Squid	58.42	27.94	1.6		8000		
Mashua		71.12	27.94	2		1800		
Mashua		68.58	27.94	2		1700		
Mashua		68.58	40.64			2800		
Mashua		63.5	35.56	3		1300		
Boti	Squid	55.88	30.48	2		1500		
Boti	Squid	55.88	30.48	2		1500		
Mashua		0	0		0.547105		7000	1500
Mashua		66.04	45.72	11	0.354009	5500		
Mashua		76.2	33.02	4	0.408472	1000		
Boti	Squid	81.28	45.72	9	0.435703	4500		
Boti	Squid	83.82	27.94	5	0.449319		3000	1500
Boti	Squid	83.82	35.56	5	0.449319	2200		
Mashua		99.06	50.8	7	0.531014	10500		
Dau		104.14	43.18	8	0.558245		6000	2000
Dau	Squid	127	55.88		0.680787	15000		
Dau		127	66.04		0.680787	18000		
Mashua		132.08	60.96		0.708018		14000	7000
Boti		142.24	81.28		0.762481		19000	12000
Boti		139.7	71.12		0.547105	c	14500	20000
Boti	Squid	53.34	25.4	1.5		500		
Mashua		58.42	43.18	2		2000		
Mashua		60.96	33.02	2		1500		
Mashua		55.88	30.48	2		2000		
Boti	Squid	53.34	0	2.4		1800		
Boti	Squid	50.8	25.4	3		1700		
Boti	Squid	55.88	27.94	3.5		2400		
Boti	Squid	86.36	38.1	8.5			4500	
Ngalawa	Squid	55.88	26.416	2		1600		
Mashua		106.68	35.56				6000	2000
Boti	Squid	55.88	27.94	2.4		1600		
Boti	Squid	63.5	38.1	5		4500		
Boti	Squid	58.42	25.4	2		1000		
Boti	Squid	50.8	25.4	1		600		
Boti	Sardine	60.96	30.48	2		15000		
Mashua		50.8	24.13	1.4		1200		
Boti	Squid	53.34	25.4	1.58		1500		
Boti	Squid	53.34	25.4	1.5		1600		

Boti	Squid	58.42	25.4	2	1300	
Boti	Squid	60.96	25.4	2	1300	
Boti	Squid	53.34	22.86	1.5	1000	
Boti	Squid	60.96	25.4	2	1400	
Boti	Squid	55.88	22.86	1	600	
Boti		43.18	17.78	0.5	400	
Boti	Squid	50.8	19.05	0.8	700	
Boti	Squid	68.58	20.32	2	1000	
Boti	Squid	60.96	25.4	2.3	1000	
Boti	Squid	60.96	25.4	2.3	1000	
Mashua		48.26	25.4	1	1500	
Boti	Squid	58.42	22.86	1.4	700	
Boti	Squid	50.8	20.32	1	500	
Boti	"Bagaa Up	53.34	22.86	1	800	
Boti	"Bagaa Up	45.72	19.05	0.8	500	
Boti	Sardine	60.96	27.94	2	1300	
Mashua		58.42	22.86	2	1000	
Mashua		60.96	25.4	2	1400	
Mashua		63.5	22.86	2	1600	
Mashua		60.96	22.86	2	1400	
Mashua		60.96	22.86	2	1200	
Boti	Squid	53.34	22.86	2	1600	
Boti	Squid	55.88	22.86	2	1600	
Boti	Squid	60.96	22.86	14.4	800	
"MTumb"	Sardine	55.88	20.32	2	900	
"MTumb"	Sardine	55.88	21.59	2	900	
Boti	Squid	66.04	27.94	2.5	1500	
Boti	Squid	50.8	17.78	1	600	
Boti	Squid	48.26	17.78	1	500	
Boti	Squid	43.18	15.24	0.5	500	
Boti	Squid	43.18	15.24	0.5	400	
Boti	Squid	58.42	22.86	1.3	600	
Boti	Sardine	66.04	22.86	1.3	1000	
Boti	Squid	58.42	20.32	1	7000	
Boti	Squid	50.8	17.78	0.8	500	
Boti	Squid	58.42	22.86	1	650	
Boti	Squid	58.42	21.59	1	850	
Boti	Squid	58.42	22.86	1	600	
Boti	Squid	53.34	20.32	1	500	
Boti	Sardine/Sq	63.5	23.622	1.5	4700	
Boti	Squid	58.42	20.32	1	4500	
Boti	Squid	45.72	17.78	0.8	4500	
Dau	Squid	71.12	35.56	4	2500	
Boti	Sardine	45.72	15.24	0.5		500
Boti	Squid	63.5	20.32	1	1000	
Boti	Squid	53.34	25.4	1.5	1000	
Boti	Squid	58.42	15.24	0.5	300	
Mashua		71.12	33.02	2		
Mashua		63.5	25.4	1.8		
Mashua		71.12	30.48	2		
Mashua		68.58	33.02	2		

Mashua		66.04	30.48	2		
Mashua		71.12	25.4	2		
Mashua		58.42	25.4	2		
Mashua		68.58	27.94	3	1600	
Mashua		66.04	25.4	3	1700	
Mashua		63.5	27.94	3	1500	
Mashua		71.12	25.4	3	1800	
Mashua		71.12	25.4	3	2000	
Mashua		68.58	27.94	3	1800	
Mashua		63.5	27.94	3	1500	
Mashua		68.58	25.4	3	1600	
Mashua		58.42	24.13	3	1500	
Mashua		0	0			
Mashua		0	0			
Mashua		0	0			
Mashua		0	0			
Mashua		0	0			
Mashua		0	0			
Mashua		58.42	27.94	2	2000	
Mashua		71.12	26.67	2	25000	
Mashua		68.58	25.4	2	2000	
Mashua		66.04	27.94	2.4	2500	
Mashua		73.66	27.94	2.5	2400	
Mashua		71.12	25.4	2	2300	
Boti	Sardine	43.18	20.32	0.7	500	
Mashua		66.04	27.94	2	1400	125
Mashua		63.5	25.4	2	1500	125
Mashua		68.58	28.448	2	1300	125
Mashua		71.12	27.94	2	1400	125
Mashua		66.04	25.4	2	1500	125
Mashua		68.58	27.94	2	1400	125
Mashua		0	0			125
Mashua		0	0			125
Mashua		0	0			125
Mashua		0	0			125
Mashua		0	0			125
Mashua		0	0			125
Mashua		0	0			125
Mashua		0	0			125
Mashua		0	0			125
Mashua		0	0			125
Mashua		88.9	40.64	3	1300	
Boti	Squid	48.26	20.32	0.6	500	
Mashua		66.04	30.48	2	1900	
Mashua		76.2	35.56	3	3500	
Mashua		66.04	27.94	2	1600	
Mashua	Squid	63.5	30.48	2.4	2000	
Mashua	Squid	66.04	30.48	2	1600	
Mashua	Squid	71.12	27.94	2	1800	
Mashua		66.04	30.48	2	2100	
Mashua		66.04	30.48	2.5	2300	

Mashua		63.5	30.48	3	3000		
Mashua		63.5	33.02	3	3000		
Mashua		60.96	30.48	2.5	2700		
Boti	Squid	60.96	27.94	2	1800		
Boti		73.66	38.1	3	3000		
Boti		66.04	27.94	2	2000		
Mashua		53.34	25.4	1.6	1800		
Mashua		63.5	27.94	2	2200		
Boti	Squid	63.5	25.4	2	2000		
Boti	Squid	66.04	27.94	2	2100		
Mashua		58.42	27.94	1.5	2000		
Mashua		53.34	22.86	1	1500		
Mashua		60.96	40.64	4			
Mashua		68.58	30.48	2	2300		
Boti	Sardine	66.04	27.94	4	1500		
Dau	Squid	55.88	33.02	2	300		
Dau	Squid	53.34	30.48	2	300		
Boti	Sardine	106.68	66.04		10000		
Mashua		63.5	27.94	3		1500	
Mashua		71.12	38.1	4	2500		
Mashua		68.58	33.02	4	2500		
Mashua		81.28	40.64	6	4500		
Mashua		81.28	40.64	5			
Mashua		101.6	43.18	10	4800		
Mashua		96.52	45.72	10		5500	1300
Mashua		101.6	45.72	11	6000		
Mashua		91.44	50.8	13			
Dau	Squid	0	0		4000		
Mashua		96.52	45.72	9		8000	1500
Boti	Sardine	91.44	55.88	9	9600		
Boti	Squid	93.98	40.64	5	4000		
Boti	Squid	99.06	48.26	8	8500		
Boti	Squid	86.36	38.1	6	4800		
Mashua		66.04	30.48	4	4000		
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